

**Army Regulation 11-9**

**Army Programs**

# **The Army Radiation Safety Program**

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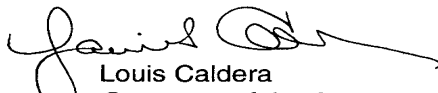
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Effective 29 June 1999

Army Programs

The Army Radiation Safety Program

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Louis Caldera  
Secretary of the Army

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**History.** This is a new regulation.

**Summary.** This regulation prescribes Army radiation safety policy. It is a consolidation of several regulations that partially covered this policy. It implements DODI 6055.8 and DODI 6055.11. It includes Army policy for the use, licensing, disposal, transportation, dosimetry, accident reporting, safety design, and inventory control of and radiation exposure standards for ionizing and nonionizing radiation sources. This regulation updates policy to be consistent with current Federal radiation safety regulations; simplifies Army radiation authorization, Army radiation permit, and Nuclear Regulatory Commission license application procedures; requires Army radiation authorizations for the use of machine-produced ionizing radiation; and strengthens MACOM and installation radiation safety authority.

**Applicability.** This regulation applies to the Active Army, the Army National Guard of the

United States, the Army Reserve, and Army contractors. This regulation does not apply to nuclear weapons (AR 50-5).

**Proponent and exception authority.** The proponent of this Army regulation is the Director of the Army Staff (DAS). The DAS has the authority to approve exceptions to this regulation that are consistent with controlling law and regulation. The DAS may delegate this authority, in writing, to a division chief within the proponent agency in the grade of colonel or civilian equivalent.

**Army management control process.** This regulation contains management control provisions and identifies key management controls that must be evaluated.

**Supplementation.** Supplementation of this regulation is prohibited without prior approval from HQDA (DACS-SF), WASH DC 20310-0200.

**Suggested improvements.** Users are invited to send comments and suggested improvements on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to HQDA (DACS-SF), WASH DC 20310-0200.

**Distribution.** This publication is available in electronic media only and is intended for command level C for Active Army and D for Army National Guard of the United States.

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\*This regulation supersedes AR 40-14, 30 June 1995; AR 40-46, 15 November 1974; AR 385-9, 1 April 1982; and AR 385-11, dated 1 May 1980  
AR 11-9 ● 28 May 1999

## Table of Contents

<b>Chapter 1</b>	<b>5</b>
<b>Introduction</b>	<b>5</b>
1-1. Purpose	5
1-2. References	5
1-3. Explanation of terms	5
1-4. Responsibilities	5
1-5. Army Radiation Safety Council	9
1-6. Installation Radiation Safety Committee	9
1-7. Radiation Safety Committee	10
1-8. General	10
1-9. Deviations	10
<b>Chapter 2</b>	<b>11</b>
<b>Ionizing Radiation Sources</b>	<b>11</b>
2-1. General	11
2-2. Nuclear Regulatory Commission licenses	11
2-3. Army radiation authorizations	11
2-4. Army radiation permits	12
2-5. Decommissioning records	13
2-6. Transfer and transport	13
2-7. Radioactive waste disposition	14
2-8. Survey instruments	14
<b>Chapter 3</b>	<b>17</b>
<b>Lasers</b>	<b>17</b>
3-1. General	17
3-2. Military-exempt lasers	17
<b>Chapter 4</b>	<b>17</b>
<b>Radiofrequency electromagnetic radiation</b>	<b>17</b>
4-1. General	17
4-2. Measurement and evaluation of RF fields	18
<b>Chapter 5</b>	<b>18</b>
<b>Radiation safety standards, dosimetry, and recordkeeping</b>	<b>18</b>
5-1. General	18
5-2. Ionizing radiation	18
5-3. Radioactive contamination	20
5-4. Nonionizing radiation	20
<b>Chapter 6</b>	<b>23</b>
<b>Special reporting requirements</b>	<b>23</b>
6-1. General	23
6-2. Ionizing radiation	23
<b>Appendix A</b>	<b>24</b>
<b>Publications</b>	<b>24</b>
Section I Required Publications	24
Section II Related Publications	26
Section III Prescribed Forms	28
Section IV Referenced Forms	28

<b>Appendix B .....</b>	<b>29</b>
<b>Sample application for Army Radiation Authorization (DA Form 3337) .....</b>	<b>29</b>
<b>Appendix C .....</b>	<b>31</b>
<b>Management Control Evaluation Checklist.....</b>	<b>31</b>
C-1. Function .....	31
C-2. Purpose .....	31
C-3. Instructions.....	31
C-4. Test questions.....	31
C-5. Supersession .....	31
C-6. Comments.....	31
<b>Glossary.....</b>	<b>32</b>
<i>Section I Abbreviations.....</i>	<i>32</i>
<i>Section II Terms.....</i>	<i>36</i>
<b>Index .....</b>	<b>44</b>

# Summary of Change

AR 11-9

## **Army Programs**

The Army Radiation Safety Program

This publication—

- Establishes radiation safety policies and procedures for all ionizing and nonionizing radiation sources used by Army personnel or on Army installations (located throughout).
- Establishes the position of Army Radiation Safety Officer (para 1-4).
- Establishes the Army Radiation Safety Council (para 1-5).
- Provides personnel radiation exposure standards (table 5-1).
- Provides radioactive contamination guidelines and radioactive waste disposal instructions (para 5-3).
- Provides radiation accident and incident reporting policies (chap 6).
- Provides instructions for applying for Nuclear Regulatory Commission licenses, Army radiation authorizations, and Army radiation permits (chap 2).
- Integrates risk management into the Army radiation safety program (chap 1).

## **Chapter 1**

### **Introduction**

#### **1-1. Purpose**

This regulation establishes policies and procedures for the use of, licensing, disposal, transportation, safety design, and inventory control of ionizing and nonionizing radiation sources. It also provides radiation exposure standards and dosimetry and accident reporting instructions. Its objective is to assure safe use of radiation sources and compliance with all applicable Federal and DOD rules and regulations.

#### **1-2. References**

Required and related publications are listed in appendix A.

#### **1-3. Explanation of terms**

Abbreviations and special terms used in this regulation are explained in the glossary.

#### **1-4. Responsibilities**

- a. The Assistant Secretary of the Army (Installations and Environment) (ASA(I&E)) establishes overall Army environment, safety, and occupational health policy and maintains general oversight of and serves as advocate for the Army Radiation Safety Program.
- b. The Assistant Secretary of the Army (Manpower and Reserve Affairs) establishes overall Army health and preventive medicine policy and maintains oversight of medical and health aspects of the Army Radiation Safety Program.
- c. The Director of Army Safety (DASAF), Office of the Chief of Staff, Army, will—
  - (1) Provide Army Staff oversight of the Army Radiation Safety Program.
  - (2) Administer, direct, and integrate Army Force Protection risk management (AR 385-10).
  - (3) Chair the Army Radiation Safety Council (ARSC).
  - (4) In coordination with the ASA (I&E), designate, in writing, a qualified nuclear medical science officer (SSI 72A67C) colonel to serve as Army Radiation Safety Officer (Army RSO).
- d. The Commanding General, Army Materiel Command (AMC) will—
  - (1) Control NRC (Nuclear Regulatory Commission) licenses and Army radiation authorizations for Army radioactive commodities.
  - (2) Provide ionizing radiation dosimetry services (at the Army Ionizing Radiation Dosimetry Center (AIRDC)) that meet the requirements of 10 CFR 20.1501(c). The Chief, AIRDC, will—
    - (a) Publish instructions for starting, maintaining, and ending personnel dosimetry services (SB 11-206).
    - (b) Maintain the Army's Central Dosimetry Records Repository (CDRR). The CDRR will archive comprehensive dosimetry records for all Army personnel and for other personnel who use Army dosimetry services. Records will meet the requirements of 10 CFR 20.2106 and 20.2110. Records will include results of bioassays, administrative dose assignments (including copies of documents that make the assignments), and supplementary occupational dose equivalent information (for example, dosimetry information resulting from off-duty employment, "moonlighting") that any radiation safety officer (RSO) reports. In particular, the AIRDC will meet the requirements of 10 CFR 20.2106(f) for long-term retention of these records.
    - (c) Provide quarterly personnel dosimetry reports (automated dosimetry record (ADR)) to RSOs for all personnel who received dosimetry services during the previous calendar quarter. These reports will enable supported RSOs to meet all recordkeeping requirements in 10 CFR 20.2106.



- (d) Provide reporting services that enable RSOs to meet all requirements of 10 CFR 19.13, 29 CFR 1910.1096(n) and (o), and 29 CFR 1926.53(p) and (q).
  - (e) Provide reporting services that meet the requirements of 10 CFR 20.2206.
  - (f) Notify immediately (by telephone or message) the RSO, The Surgeon General (TSG), the major Army command (MACOM) radiation safety staff officer (RSSO), and the Army RSO when AIRDC records indicate that any Army personnel ionizing radiation exposure standard (table 5-1) may have been exceeded.
- (3) Provide Army low-level radioactive waste disposal services (TM 3-261) (at the Army Low-Level Radioactive Waste Disposal Division, U.S. Army Industrial Operations Command, ATTN: AMSIO-DMW, Rock Island, IL 61299-6000). In addition:
  - (a) Establish procedures for implementing the Army's responsibility as DOD Executive Agent for Low-Level Radioactive Waste Disposal.
  - (b) Maintain records of all Army radioactive waste disposal by burial.
- (4) Provide the Army radiation test, measurement, and diagnostic equipment (TMDE) program and accredited radiation instrument calibration services (AR 750-43 and TB 750-25).
- (5) In coordination with CG, U.S. Army Medical Command (MEDCOM), maintain capability to provide on-site radiation safety support following radioactive material contamination accidents and incidents.
- (6) Assure that foreign military sales of radioactive material (RAM) and items that contain RAM comply with applicable United States regulations and DOD directives.
- e. The Surgeon General will—
  - (1) Establish Army radiation safety personnel exposure standards as necessary and provide them to the Army RSO for promulgation (para 1-4l(3)).
  - (2) Approve all radiation dose limits in excess of limits promulgated in this regulation (chap 5) and provide these limits to the Army RSO for promulgation as necessary (para 1-4l(3)).
  - (3) Establish and promulgate Army radiological health guidelines for deployment operations as necessary.
  - (4) Provide Army Staff supervision on the medical and health aspects of exposure to ionizing radiation associated with doses that AIRDC documents.
- f. The Commanding General, Training and Doctrine Command (CG, TRADOC), will—
  - (1) Include appropriate radiation safety training in MOS/SSI-producing courses and in unit mission-essential task list (METL) profiles for personnel in MOS/SSIs (military occupational specialty/specialty skill identifier) and TOE units that use radiation and radioactive commodities.
  - (2) Prepare training modules [in coordination with CG, AMC and CG, Army Medical Department Center and School (CG, AMEDDC&S), about protection from U.S. and foreign ionizing and nonionizing radiation sources that may expose Army personnel to radiation during deployment. These modules will be available for radiation safety training of deploying and deployed personnel as necessary.
- g. The Commanding General, U.S. Army Medical Command will—
  - (1) Prepare training modules (at AMEDDC&S), in coordination with CG, TRADOC and CG, AMC about health hazards of, protection from, and medical treatment of injuries caused by U.S. and foreign radiation sources that may expose Army personnel during deployment. These modules will be available for radiation safety training of deploying and deployed personnel as necessary.
  - (2) In coordination with CG, AMC, maintain capability to provide on-site medical advice and support following radioactive contamination accidents or incidents (AR 40-13).

- (3) Survey each installation and each NRC license, Army reactor permit, or Army radiation authorization (ARA) holder at least once every three years for compliance with applicable radiation safety and health regulations and guidance (AR 40-5).
  - (4) Establish appropriate occupational health surveillance for personnel occupationally exposed to radiation (AR 40-5).
  - (5) Perform health hazards assessments (HHAs) of commodities and systems that emit radiation or contain RAM as early as practical in development and before fielding (AR 40-10).
  - (6) Provide radiation bioassay services (AR 40-5) that comply with criteria of the American National Standards Institute (ANSI) (see ANSI N13.30). Such services are available from the U.S. Army Center for Health Promotion and Preventive Medicine (CHPPM) on a cost-reimbursable basis.
  - (7) Provide medical support for investigations of alleged excessive radiation exposures (DODI 6055.11 and DA PAM 40-18).
- h. The Assistant Chief of Staff for Installation Management (ACSIM) will provide oversight for all radioactive contamination surveys conducted in support of base closure or installation restoration activities.
- i. Each MACOM commanding general will—
- (1) Assure installation and subordinate command compliance with conditions of AMC-held radioactive commodity NRC licenses and ARAs. (See para 2-1b.)
  - (2) Designate, in writing, a person to be the MACOM RSSO.
  - (3) Issue ARAs as necessary (para 2-3).
  - (4) As necessary, establish and employ procedures to assure that captured, purchased, borrowed, or otherwise obtained foreign equipment and materiel are surveyed for RAM and that appropriate actions are taken following discovery of any RAM in those items.
  - (5) Concerning the MACOM radiation safety program:
    - (a) Establish review and approval procedures for conducting risk management in accordance with established doctrine (DODI 6055.1).
    - (b) Maintain a central register of risk decisions regarding deviations from the Army standards of this regulation and DA PAM 40-18 within the command.
    - (c) Assure that the complete risk management process is executed before the conduct of all operations.
  - (6) Report excess military-exempt lasers to the Defense Reutilization and Marketing Service for utilization screening within DOD (DOD 4160.21-M-1). (See para 3-2c.)
    - (a) Maintain accountability during the screening period.
    - (b) Losing and gaining organizations will transfer excess directly between themselves.
    - (c) After utilization screening is completed, identify supply system requirements for usable parts. Return required parts to the supply system.
- j. Each installation commander—
- (1) Will designate, in writing, a qualified individual to be Installation RSO.
  - (2) May establish an Installation Radiation Safety Committee (RSC). (See para 1-6.)
  - (3) Will prepare and maintain historical records of location of use or storage of RAM on the installation and the responsible activity for that use or storage (para 2-5).
  - (4) Will maintain documentation listing locations categorized as “RF controlled” and “RF uncontrolled” environments as necessary (DODI 6055.11).
  - (5) Issue Army radiation permits as necessary (para 2-4).
- k. Each commander will—
- (1) Designate, in writing, a person to be the RSO when any of the following is true.

- (a) When a NRC license, Army reactor permit, ARA, or applicable technical publication requires it.
    - (b) When para 5-2b requires any personnel in the command to wear AIRDC-issued dosimetry.
    - (c) When para 5-2c requires any personnel in the command to participate in a bioassay program.
    - (d) When the activity operates, maintains, or services a class IIIb or class IV laser system (section 1.3, ANSI Z136.1) that is not type-classified. The title of the person so designated may be "laser safety officer" (LSO).
  - (2) When paragraph (1) above requires the designation of an RSO (or LSO)—
    - (a) Establish written policies and procedures to assure compliance with applicable Federal, DOD, and Army radiation safety regulations and directives. These documents will include emergency reaction plans as necessary and procedures for investigating and reporting radiation accidents, incidents, and overexposures (chap 6).
    - (b) Assure that an internal (for example, the RSO or local acting IG (Inspector General)) or external (for example, the TSG (para 1-4g(3)) or an RSO from another command) agent or agency audits the radiation safety program annually.
  - (3) Assure that all personnel occupationally exposed to radiation receive appropriate radiation safety training commensurate with potential hazards from radiation sources they may encounter.
  - (4) Maintain an inventory of radiation sources as higher headquarters directs and in accordance with requirements of NRC licenses, Army reactor permits, ARAs, and technical publications.
  - (5) For radioactive commodities in the command, establish written policies and procedures as necessary to assure compliance with radiation safety requirements in applicable technical publications. (See para 2-1b(1).)
- I. The Army Radiation Safety Officer will—
- (1) On behalf of the DASAF, direct the Army Radiation Safety Program.
  - (2) On behalf of the DASAF, develop, manage, and promulgate Army radiation safety policy and guidance.
  - (3) On behalf of TSG, promulgate Federal and Army radiation safety personnel exposure standards within the Army.
  - (4) On behalf of the ASA (I&E), provide HQDA oversight of the DOD Executive Agency for Low-Level Radioactive Waste, to include matters concerning depleted uranium.
  - (5) Resolve radiation safety issues between MACOMs as necessary.
  - (6) Promote good radiation safety practices throughout the Army.
  - (7) Provide radiation safety consultation to the DA staff and MACOM commanders and staffs.
  - (8) Serve as HQDA radiation safety point-of-contact with other DOD and Federal agencies.
  - (9) Represent HQDA on DOD radiation safety committees, working groups, and panels.
  - (10) Coordinate HQDA-level radiation safety plans and responses to radiation emergencies, accidents, and incidents.
  - (11) Integrate risk management into the Army Radiation Safety Program.
- m. Major Army command RSSOs will—
- (1) Assure MACOM implementation of Army radiation safety policy.
  - (2) Direct the MACOM radiation safety program.
  - (3) Establish MACOM radiation safety policy.

- (4) Provide radiation safety consultation to the MACOM commanding general and staff and to subordinate commanders and staffs.
  - (5) Serve as MACOM radiation safety point-of-contact.
- n. Each Installation RSO will—
  - (1) Direct the installation radiation safety program.
  - (2) Assist TOE (Table of Organization and Equipment) units on the installation to meet requirements of NRC licenses and ARAs for radioactive commodities. In particular, the installation RSO will—
    - (a) Assure that TOE unit personnel receive appropriate radiation safety training as necessary.
    - (b) Meet all reporting requirements for accidents or incidents (para 6-2).
    - (c) Assure appropriate inventory control per applicable technical publications and logistics regulations.
  - (3) Notify the AMC RSSO when a building or area that currently or formerly contained radioactive commodities is scheduled for demolition or will no longer contain radioactive commodities. This is to provide AMC radioactive commodity license holders appropriate notice so that they can take decommissioning actions as necessary.
- o. Each RSO (or LSO), including the installation RSO, will—
  - (1) Perform or be responsible for the performance of all radiation safety functions that applicable Federal, DOD, and Army regulations and NRC license, Army reactor permit, and ARA conditions require.
  - (2) Establish plans and procedures for handling credible emergencies involving radiation and radioactive materials. This includes coordination with civilian and military emergency response organizations as necessary.
  - (3) Coordinate with supporting medical personnel to help assure that personnel receive appropriate occupational health surveillance (AR 40-5).
  - (4) For an RSO with laser safety responsibilities, assume the responsibilities of an LSO as listed in section 1.3.2, ANSI Z136.1, except for occupational health responsibilities. (The RSO or LSO will assist the occupational health physician as necessary in meeting laser occupational health responsibilities.)

#### **1-5. Army Radiation Safety Council**

- a. The ARSC is the Chief of Staff, Army's advisory body to provide recommendations for Army radiation safety directives and to gather and disseminate information about the status of the Army radiation safety program.
- b. Membership includes the DASAF as chair (para 1-4c(3)), the Army RSO as recorder, the Radiological Hygiene Consultant to TSG, a representative of the ACSIM (Assistant Chief of Staff for Installation Management), a representative of the Army Reactor Office (AR 50-7), and the RSSO from each MACOM, the National Guard Bureau, and the Office, Chief Army Reserve.
- c. The ARSC will meet at least once each 6 month period and at the call of the chair.

#### **1-6. Installation Radiation Safety Committee**

- a. The installation RSC is the installation commander's advisory body to gather and disseminate information about the status of the installation radiation safety program.
- b. Membership includes a chair that the commander designates, the installation RSO (recorder), and all tenant RSOs. Installations with large numbers of TOE unit personnel that use radioactive commodities will include military representatives knowledgeable about the TOE units' radiation safety programs.
- c. Each installation RSC will meet at least once each calendar year and at the call of the chair.

### **1-7. Radiation Safety Committee**

When a technical publication or conditions of a NRC license, Army reactor permit, or ARA require an RSC, it will meet the following requirements in addition to any other requirements of applicable directives.

- a. The RSC will meet at least once in each six-month period and at the call of the chair.
- b. A representative of the commander (that is, the commander or someone at the executive level in the organization who is not a radiation user) should chair the RSC. The RSO should be recorder and will be a voting member. The installation RSO may be a non-voting member.
- c. The RSO will provide a copy of the minutes of each RSC meeting to the installation RSO.

### **1-8. General**

- a. Although a commander may assign radiation safety functions and the organizational location of the RSO (or LSO) to anywhere in the organization, the RSO and LSO will have direct access to the commander for radiation safety purposes as necessary.
- b. Keep personnel exposure to ionizing radiation at a level as low as is reasonably achievable (ALARA).
- c. Organizations involved in research, development, testing, and evaluation (RDTE), and in acquisition of equipment that emits radiation or contains RAM will-
  - (1) Identify hazards and controls and incorporate protection measures or identify operational restrictions before fielding.
  - (2) Process residual risks for acceptance per AR 70-1 and AR 385-16 before fielding materiel.
- d. Proponents of technical publications will include radiation safety requirements about siting, operation, and maintenance of commodities and systems that contain RAM or emit radiation, as appropriate.
- e. Army overseas controls of radiation sources will be at least as protective as are Army domestic controls.
- f. Use risk management to identify the options and residual risk for decision by the decision authority. See FM 25-101 and FM 101-5 for a detailed discussion of steps for performing the risk management process.

### **1-9. Deviations**

- a. Limit deviations to only those from Army radiation safety standards and procedures. Deviations from Federal and DOD regulations and standards and from NRC license, Army reactor permit, and ARA conditions, including those implemented in technical publications, are not authorized.
- b. The following personnel may authorize deviations from Army standards and procedures (para a above). (Deviations from personnel radiation exposure standards require TSG's approval.)
  - (1) Each MACOM commanding general.
  - (2) The Superintendent, U.S. Military Academy.
  - (3) The Chief, National Guard Bureau (NGB). (The Chief, NGB may sub-delegate deviation authority to the State Adjutant Generals.)
- c. Only personnel listed in paragraph b above may approve residual risk levels deemed to be high or extremely high. Authority to accept residual risk will be per FM 101-5. For the purpose of this paragraph, the personnel listed in paragraph b above are considered MACOM commanding generals.
- d. Grant deviations for 1 year or less. The respective approval authority may approve deviation renewals provided conditions cited in the original deviation remain the same.
- e. Any accident or mishap occurring under an approved deviation will cause automatic termination of the approval until the respective approving authority completes an investigation and re-validates the deviation.

- f. Forward requests through command channels to HQDA (DACS-SF), WASH DC 20310-0200, for waivers and exceptions to Federal or DOD radiation safety regulations. Prior approval from HQDA (DACS-SF), WASH DC 20310-0200, is required before such requests are sent to a Federal agency or to DOD. Prior approval of TSG is also required before requests for waivers or exceptions to Federal or DOD personnel radiation exposure standards are sent to a Federal agency or to DOD.

## **Chapter 2**

### **Ionizing Radiation Sources**

#### **2-1. General**

- a. Materiel. AR 70-1 applies to developmental and non-developmental materiel containing radiation sources.
- b. Compliance with NRC regulations and NRC license, Army reactor permit, and ARA conditions.
  - (1) All Army personnel using RAM will comply with all applicable NRC regulations and conditions of NRC licenses, Army reactor permits, and ARAs held by their own or by another command (paras 2-2a(2) and 2-3b(2)).
  - (2) Holders of NRC licenses, Army reactor permits, and ARAs will assure that all personnel using RAM are aware of applicable regulations and conditions as appropriate.
- c. Shielding and control designs. A qualified expert will design, review, and test shielding of and controls for access to radiation areas, high radiation areas, and very high radiation areas. Perform these procedures per applicable regulations and guidelines before routinely using radiation sources within the area. Each design for high radiation and very high radiation areas will receive an additional independent review by a qualified expert that the MACOM RSSO designates.
- d. Environmental requirements. See 10 CFR 51, 40 CFR, AR 200-1, and AR 200-2 for RAM environmental requirements.

#### **2-2. Nuclear Regulatory Commission licenses**

The NRC licenses special, source, and byproduct material in the U.S. and its possessions.

- a. Send applications for new licenses, license renewals, and license amendments through command channels to the MACOM headquarters for forwarding to the NRC.
  - (1) The MACOM commanding general may allow subordinate commanders to forward applications directly to the NRC without MACOM review.
  - (2) When compliance with conditions proposed in the application requires efforts of personnel of another command, obtain a letter of agreement from an authorized representative of that command (paras 1-4I(5) and 2-1b).
  - (3) The applicant or MACOM RSSO will provide a copy of all correspondence relating to applications to Commander, CHPPM, Aberdeen Proving Ground, MD 21010-5422.
  - (4) Tenant commanders will provide a copy of each NRC license, including all amendments, to the installation commander.
- b. Except as specified in paragraphs 1-9f and 2-2a, all Army personnel may communicate directly with the NRC without restriction. However, a person considering such communication should also consider whether information to be requested is obtainable from Army sources and whether information provided or obtained is of interest to the chain of command or other Army organizations.

#### **2-3. Army radiation authorizations**

- a. The Army uses ARAs to control specific Army ionizing radiation sources (including machines that emit ionizing radiation) that the NRC does not license. An ARA is required for all such sources except

- (1) Byproduct, source, or special material that the NRC has declared to be license-exempt (10 CFR 30, sections 30.14 through 30.20; 10 CFR 40, sections 40.13 and 40.14; and 10 CFR 70, section 70.14) or generally licenses (10 CFR 31; 10 CFR 40, sections 40.20 through 40.28; and 10 CFR 70, section 70.19).
  - (2) Less than 0.1 microcurie ( $\mu\text{Ci}$ ) [3.7 kilobecquerels (kBq)] of radium.
  - (3) Less than 1 ( $\mu\text{Ci}$  (37 kBq) of any naturally occurring or accelerator produced RAM (NARM) other than radium. See paragraph c(2) for other NARM exemptions.
  - (4) For electron tubes containing less than 10 ( $\mu\text{Ci}$  (370 kBq) of any NARM radioisotope.
  - (5) For machine-produced ionizing radiation sources not capable of producing a high radiation area or very high radiation area. (For example, medical and dental diagnostic x-ray systems do not require an ARA.) However, commanders will establish policies and procedures to assure that design and use of these excepted sources are in compliance with applicable radiation safety regulations and guidelines and that only appropriately trained and authorized personnel operate them.
  - (6) For Army nuclear reactors and Army reactor-produced RAM that remains at the reactor site. The Army Reactor Office issues Army reactor permits for these sources (AR 50-7).
- b. Forward applications for new ARAs, ARA renewals, and ARA amendments through command channels to MACOM headquarters for approval.
- (1) Use DA Form 3337, Application for Army Radiation Authorization (appendix B) for new ARAs. Use either DA Form 3337 or a memorandum that refers to the original DA Form 3337 for ARA renewals and amendments.
  - (2) When compliance with conditions proposed in the application requires efforts of personnel of another command, obtain a letter of agreement from an authorized representative of that command (paras 1-4l(5) and 2-1b).
  - (3) The MACOM RSSO will assure that applications meet appropriate regulatory and advisory guidelines before sending approval through command channels to the applicant.
  - (4) Tenant commanders will provide a copy of each ARA, including all amendments, to the installation commander.
- c. The Army's ARA program will be similar to the NRC's licensing program. The Army will apply NRC regulations and guidance, modified as necessary, in its control of ARA ionizing radiation sources. Most ARA conditions will be similar to standard NRC license conditions.
- (1) When an ARA applicant possesses or is applying for a NRC license to which ARA RAM use can be linked the application need only reference the NRC license. The issued ARA may reference the NRC license and incorporate the expiration date and all conditions of the NRC license.
  - (2) The NRC's regulations regarding license-exempt concentrations (10 CFR 30.14) and quantities (10 CFR 30.18) will be applied similarly to NARM with respect to ARA exemption upon HQDA approval. Applicants for such exemptions will send supporting documents through command channels to HQDA (DACS-SF), WASH DC 20310-0200.
- d. The MACOM RSSO will provide a copy of all correspondence relating to ARA applications to Commander, CHPPM, Aberdeen Proving Ground, MD 21010-5422.
- e. A sample ARA is in figure 2-1.

#### **2-4. Army radiation permits**

Non-Army agencies (including civilian contractors) require an Army radiation permits (ARP) to use, store, or possess ionizing radiation sources on an Army installation (32 CFR 655.10). (For the purpose of this paragraph, ionizing radiation source means any source that, if held or owned by an Army organization, would require a specific NRC license or ARA.)

- a. The non-Army applicant will apply by letter with supporting documentation (para b below) through the appropriate tenant commander to the installation commander. Submit the letter so that the installation commander receives the application at least 30 days before the requested start date of the permit.

- b. The ARP application will specify start and stop dates for the ARP and describe for what purposes the applicant needs the ARP. The installation commander will approve the application only if the applicant provides evidence to show that one of the following is true.
  - (1) The applicant possesses a valid NRC license or Department of Energy (DOE) radiological work permit that allows the applicant to use the source as specified in the ARP application.
  - (2) The applicant possesses a valid Agreement State license that allows the applicant to use RAM as specified in the ARP application, and the applicant has filed NRC Form-241, Report of Proposed Activities in Non-Agreement States, with the NRC in accordance with 10 CFR 150.20. An ARP issued under this circumstance will be valid for no more than 180 days in any calendar year.
  - (3) For NARM and machine-produced ionizing radiation sources, the applicant has an appropriate State authorization that allows the applicant to use the source as specified in the ARP application or has in place a radiation safety program that complies with Army regulations.
  - (4) For overseas installations, the applicant has an appropriate host-nation authorization as necessary that allows the applicant to use the source as specified in the ARP application and has in place a radiation safety program that complies with Army regulations. (Applicants will comply with applicable status-of-forces agreements [SOFAs] and other international agreements.)
- c. All ARPs will require applicants to remove all permitted sources from Army property by the end of the permitted time.
- d. Disposal of RAM by non-Army agencies on Army property is prohibited. However, the installation commander may authorize radioactive releases to the atmosphere or to the sanitary sewerage system that are in compliance with all applicable Federal, DOD, and Army regulations. (The installation commander also will give appropriate consideration to State or local restrictions on such releases.)
- e. A sample ARP is in figure 2-2.

## **2-5. Decommissioning records**

- a. Holders of NRC licenses will establish and maintain decommissioning records in accordance with 10 CFR 30.35(g), 40.36(f), and 70.25(g), as applicable.
- b. Holders of ARAs will establish and maintain decommissioning records similar to those that the NRC requires.
- c. Holders of NRC licenses and ARAs will provide information about the location of use and storage of RAM to the installation commander for the installation RAM history records (para 1-4j(3)).

## **2-6. Transfer and transport**

- a. Transfer radioactive material only to persons authorized to receive and possess it.
  - (1) The holder of the commodity license or ARA will in accordance with technical publications and applicable instructions establish transfer of Army radioactive commodities.
  - (2) For all other RAM, the shipper will obtain and retain appropriate evidence (for example, a copy of the recipient's ARA or NRC or Agreement State license) before shipping the RAM.
- b. Domestic shipments of RAM will be in accordance with applicable NRC (10 CFR 71), Department of Transportation (DOT) (49 CFR), and U.S. Postal Service (39 CFR) regulations and per DOD 4500.9-R (Part II). International shipments of RAM will be per applicable U.S. and International Atomic Energy Agency (IAEA) transportation regulations.
- c. Do not transfer radium and items containing radium to non-DOD agencies or activities (except for disposal as radioactive waste).



## **2-7. Radioactive waste disposition**

- a. Do not bury radioactive waste on Army property.
- b. Coordinate with and obtain the approval of the Chief, Army Low-Level Radioactive Waste Disposal Division, U.S. Army Industrial Operations Command, ATTN: AMSIO-DMW, Rock Island, IL 61299-6000, for all disposal by burial on non-Army property of radioactive wastes.
  - (1) This includes approval for the off-site storage, packaging, shipment, treatment, and final disposition of such unwanted low-level RAM.
  - (2) Project managers of special projects, such as U.S. Army Corps of Engineers environmental restoration projects that generate unusually large amounts of radioactive waste may arrange for radioactive waste disposal as part of the project. However, they will coordinate such actions with the Chief, Army Low-Level Radioactive Waste Disposal Division (para 1-4d(3)(b)).
- c. Release of RAM to the atmosphere or to the sanitary sewerage system will comply with all applicable NRC and EPA regulations. (Also, give appropriate consideration to State or local restrictions on such releases.)
- d. If allowed by applicable regulations or by NRC license, Army reactor permit, or ARA conditions, RAM may be held for decay and subsequent disposal without regard to radioactivity. However, disposal of such material may still require special handling as hazardous waste (AR 40-5).

## **2-8. Survey instruments**

Calibrate radiation survey instruments used for health or safety purposes at least annually using National Institute of Standards and Technology (NIST)-traceable radiation sources (AR 750-43 and TB 750-25).

- a. Some instruments may require more frequent calibration. Consult applicable technical publications and with TMDE personnel for appropriate calibration intervals as necessary.
- b. Calibration sources will be of a type and activity appropriate for the intended use of the instrument.

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DEPARTMENT OF THE ARMY  
HQ, MACOM  
CITY, STATE, AND ZIP CODE

REPLY TO ATTENTION OF

XXXX-XX (11-XXm)

15 January 2000

MEMORANDUM FOR Commander, U.S. Army Activity, Installation, City,  
State XXXXX-XXXX

SUBJECT: Army Radiation Authorization (ARA) No. XXX-XX

1. Reference memorandum, HQ, U.S. Army Activity, XXXX-XX-X, 15 November 1999, subject: Application for Renewal of Army Radiation Authorization No. XXX-XX, and enclosures thereto.

2. In accordance with referenced memorandum ARA No. XXX-XX is amended in its entirety to read as follows:

a. Expiration date: 31 January 2002.

b. Description of machine-produced ionizing radiation source and of radioactive material, its chemical and/or physical form, and maximum amount at any one time authorized under this ARA: See enclosure.

c. Authorized use: See enclosure.

d. Radiation Safety Officer: CPT Dan Hamilton.

e. Conditions: See enclosure.

3. Except as specifically provided otherwise in this ARA, conduct your program in accordance with the statements, representations, and procedures in the documents, including any enclosures, listed: referenced memorandum.

4. Our point of contact is Mr. John A. Manfre, MACOM Radiation Safety Staff Officer, DSN XXX-XXXX.

FOR THE COMMANDER:

Encl

RUPERT K. THORNE

as

LTC, GS

Adjutant

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**Figure 2-1. Sample Army radiation authorization**

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DEPARTMENT OF THE ARMY INSTALLATION

CITY, STATE, AND ZIP CODE

October 7, 1999

Radiation Safety Office

Mr. Peter H. Myers

President, Myers and Associates, Inc.

19900 W. 49th Street

Austin, Texas 78799

Dear Mr. Myers:

This letter responds to your application dated September 20, 1999, for an Army radiation permit to use a lead-paint analyzer containing no more than 30 millicuries (1.11 gigabecquerels) of cadmium-109. Your application meets the requirements of Army Regulation 11-9 (The Army Radiation Safety Program) and of title 32, Code of Federal Regulations, part 655, section 655.10.

The (Installation) Commander hereby permits you to use the lead-paint analyzer on this installation during the period October 8 through November 22, 1999 in accordance with the terms specified in your application.

You must remove all radioactive material from the installation by the end of the permitted time and provide evidence to indicate that you have done so. We do not permit disposal of radioactive material on Army property. Reapply if you wish to use the lead-paint analyzer on this installation after November 22, 1999.

Sincerely,

John A. Manfre

Radiation Safety Officer

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**Figure 2-2. Sample Army radiation permit**

## **Chapter 3**

### **Lasers**

#### **3-1. General**

- a. The design of Army laser safety programs will follow applicable guidelines in ANSI Z136.1 and ANSI Z136.3. Military-exempt laser users will comply with laser safety requirements in applicable technical publications.
- b. Army laser range safety guidance is in AR 385-63 and MIL-HBK 828.
- c. Use a type-classified or commercial class IIIb or class IV laser on an Army range only if the DOD Laser Systems Safety Working Group or CHPPM has performed a prior laser hazard evaluation for that specific kind of laser.
  - (1) A list of approved lasers is in MIL-HDBK-828. Send requests for approval of an unlisted laser through command channels to Commander, CHPPM, ATTN: MCHB-DC-OLO, Aberdeen Proving Ground, MD 21010-5422.
  - (2) Use an unlisted class IIIb and class IV laser on an Army range for RDTE purposes only. Users of such lasers will comply with paragraph a.
- d. Only a qualified expert will design, review, and test controls for access to a class IIIb or IV laser facility. Meet this requirement in accordance with applicable directives before routinely using class IIIb or IV lasers within such a facility. A qualified expert will design or review for adequacy all radiation safety SOPs (standing operating procedures) for each such facility.
- e. Use only class I, class II, and class IIIa lasers indoors on Army installations as hand-held laser pointing devices. Do not use class IIIb or class IV lasers for such purposes.

#### **3-2. Military-exempt lasers**

- a. Although exempt, military-exempt lasers will meet as many of the laser safety standards in 21 CFR 1040 as practical.
- b. Proponents of military-exempt lasers will include laser safety requirements in technical publications about siting, operation, and maintenance of these lasers and laser systems.
- c. Dispose of unwanted military-exempt lasers in accordance with DOD 4160.21-M-1. Do not dispose of potentially usable lasers or laser parts through utilization outside DOD, donation, or sale without the prior approval of the Deputy Undersecretary of Defense (Environmental Security) or designee. Send requests for such disposition through supply channels to the commanding general of the appropriate materiel readiness command.
- d. Military-exempt lasers will not include lasers intended primarily for indoor classroom training and demonstration, industrial operations, scientific investigations, or medical applications.
- e. Commanding General, USACHPPM, will maintain records for all military-exempt lasers that indicate types of laser products and manufacturers.

## **Chapter 4**

### **Radiofrequency electromagnetic radiation**

#### **4-1. General**

- a. The Army will comply with RF (radiofrequency) radiation safety program elements in DODI 6055.11. Type-classified RF EMR (electromagnetic radiation) emitting system users will comply with radiation safety requirements in applicable technical publications.
- b. Adopt no practice and conduct no operation involving planned exposure of personnel to RF levels in excess of the applicable maximum permissible exposures in DODI 6055.11.
- c. Do not use radiofrequency protective clothing for routine use to protect personnel. Protective equipment, such as electrically insulated gloves and shoes for protection against RF shock and burn or for insulation from the ground plane is permissible where necessary for compliance with induced current limits in DODI 6055.11.

- d. Identify, attenuate, or control potentially hazardous radiofrequency (RF) electromagnetic fields and other radiation hazards associated with Army electronic equipment by engineering design, protective equipment, administrative actions, or a combination thereof.
- e. Proponents of RF electromagnetic radiation-emitting systems will include radiation safety requirements in technical publications about siting, operation, and maintenance of these systems.

#### **4-2. Measurement and evaluation of RF fields**

Use measurement procedures and techniques recommended in IEEE C95.3 as basic guidance for evaluating RF hazards.

- a. Commanding General, CHPPM, will maintain records of surveys, reports, calculations, and control measures for each type-classified RF EMR emitter.
- b. Where multiple RF EMR emitters are located in fixed arrangements, RF evaluation data will include a determination of weighted contributions from expected simultaneously operated emitters.

### **Chapter 5**

## **Radiation safety standards, dosimetry, and recordkeeping**

### **5-1. General**

Personnel exposure limits in this chapter do not apply to doses or exposure due to background radiation, due to any medical administration the individual has received, or due to voluntary participation in medical research programs.

### **5-2. Ionizing radiation**

- a. Personnel exposure standards. Table 5-1 summarizes the Federal personnel radiation exposure standards that the Army follows.
  - (1) Unrestricted areas. The dose in any unrestricted area from external sources will not exceed 2 millirems (mrem) [0.02 millisievert (mSv)] in any one hour.
  - (2) Nuclear Regulatory Commission jurisdiction. Standards for exposure to ionizing radiation emitted from NRC-licensed RAM are in 10 CFR 20. The Army also applies these standards to Army reactors and to a combination of exposures to NRC-licensed RAM and other ionizing radiation sources.
  - (3) Occupational Safety and Health Administration (OSHA) jurisdiction. Federal standards for occupational exposure to all other ionizing radiation sources are in OSHA regulations (29 CFR 1910.1096 and 1926.53). However, adhere to NRC standards for all ionizing radiation sources when NRC standards are more protective than OSHA standards.
- b. Dosimetry. All occupationally exposed personnel using AIRDC dosimetry services will wear a whole-body dosimeter (worn closest to the source of radiation exposure on the trunk between the shoulders and waist). Wear supplemental dosimeters as necessary to monitor exposures to specific organs or areas, such as the thyroid, finger, hand, lens of eye, and fetus or embryo.
  - (1) Monitor, using AIRDC-supplied dosimeters (see para(2)), occupational exposure of all personnel working in Army facilities or on Army projects (including Army Corps of Engineers civil works projects) for:
    - (a) Adults likely to receive, in 1 year from sources external to the body, a dose in excess of 10 percent of any of the occupational limits in table 5-1.
    - (b) Minors and declared pregnant women likely to receive, in 1 year from sources external to the body, a dose in excess of 10 percent of any of the applicable limits in table 5-1.
    - (c) Individuals entering a high or very high radiation area.

- (2) Personnel at Army government-owned contractor-operated (GOCO) facilities and contractor personnel who are working in Army facilities and require dosimetry will use AIRDC-supplied dosimeters unless a written contract specifically exempts them. (Non-GOCO contractor personnel working under provisions of an ARP may use contractor-supplied dosimetry.)
  - (3) AIRDC dosimeters may be used to monitor the exposure of other personnel and for area monitoring. Evaluate requirements for continued use of AIRDC dosimetry for such purposes periodically (at least annually).
  - (4) DA PAM 40-18 contains instructions for wearing supplemental dosimeters.
- c. Bioassay.
- (1) Monitor occupational intake of RAM and, as necessary, assess the committed effective dose equivalent (CEDE) for:
    - (a) Adults likely to receive, in 1 year, an intake in excess of 10 percent of applicable annual limits of intake (ALI). The ALIs for NRC-licensed RAM are in table 1, columns 1 and 2, 10 CFR 20, appendix B. The Surgeon General will provide, as necessary, ALIs and related air and water concentrations for radioisotopes used under ARA authority and not listed in 10 CFR 20, appendix B to the Army RSO for promulgation.
    - (b) Minors and declared pregnant women likely to receive, in 1 year, a CEDE in excess of 0.05 rem (0.5 mSv).
  - (2) Intake of RAM may be monitored and the CEDE assessed for other individuals. Evaluate the requirement for continued intake monitoring periodically (at least annually).
  - (3) All Government- and contractor-provided bioassay will be in accordance with procedures in ANSI N13.30.
- d. Dosimetry and bioassay records.
- (1) All personnel will complete DD Form 1952, Dosimeter Application and Record of Occupational Radiation Exposure, before receiving AIRDC dosimetry or participating in a routine bioassay program.
  - (2) The RSO will provide a copy of determinations of administrative doses (para e), determinations of non-Army occupational dose histories (obtained from somewhere other than AIRDC), bioassay results, and results of assessing CEDE by bioassay or by determination of the time-weighted air concentrations to which an individual has been exposed [that is, derived air concentration (DAC)-hours] to the AIRDC for archiving.
  - (3) The RSO will provide a copy of each DD Form 1952 and calendar year ADR for routinely monitored personnel to the supporting medical treatment facility or occupational health clinic (AR 40-66). (Examples: A visitor monitored only during a short-term visit of a few days is not routinely monitored. A student or intern monitored over a period of a few months is routinely monitored.)
- e. Administrative doses.
- (1) Only TSG may approve assigning an administrative dose in place of any AIRDC-recorded occupational dose equivalent that exceeds a value in table 5-1.
  - (2) RSOs will estimate TEDE (total effective dose equivalent) or CEDE when they cannot determine it from dosimetry or bioassay (for example, if a dosimeter was lost, damaged, or believed to be deliberately exposed). The estimate of the administrative dose may be based on any of the following.
    - (a) Occupancy or workload information and radiation dose levels at the radiation source operator location.
    - (b) Data supplied by a supplemental dosimeter.
    - (c) Average of the individual's previous occupational dose for the preceding 6 to 12 months if conditions prevailed similar to those during the period for which the dose is being estimated.

- (d) Recorded doses accrued by coworkers performing similar duties under similar circumstances.
- (3) The RSO will document the reason for the administrative dose assignment and the method used to estimate it.
  - (a) For alleged overexposures, the RSO will forward request for approval of the administrative dose, with supporting documentation, through command channels to TSG.
  - (b) For all other administrative dose assignments, the RSO will provide a report to Chief, AIRDC, to be included with the person's records in the CDRR.
- f. Other requirements. Federal requirements for security of RAM; control of access to radiation areas, high radiation areas, and very high radiation areas; caution signs; posting and labeling requirements; radioactive material shipping and receiving; and so on are in 10 CFR, 29 CFR 1910.1096 and 1926.53, 49 CFR, and other applicable documents listed in the References section (app A).

### 5-3. Radioactive contamination

In the absence of other regulatory or advisory guidance, a surface is contaminated if either the removable or total radioactivity is above the levels in table 5-2.

- a. If a surface cannot be decontaminated promptly to levels below those in table 5-2, control, mark, designate, or post it per applicable regulations.
- b. Always reduce radioactive contamination to levels ALARA.
- c. Local commanders may use contamination standards more strict than those in table 5-2 but will not use standards less strict without applying risk management principles (para 1-9).

### 5-4. Nonionizing radiation

See table 5-3 for a description of the electromagnetic radiation spectrum. Refer to the following indicated references for personnel radiation exposure standards for the following types of nonionizing radiation.

- a. Lasers: ANSI Z136.1 and ANSI Z136.3.
- b. Ultraviolet, visible, infrared, and extremely low frequency electromagnetic radiation and static electric fields: (latest edition of) American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs<sup>TM</sup>) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIs<sup>TM</sup>).
- c. Radiofrequency electromagnetic radiation: DODI 6055.11.
- d. Static magnetic fields: International Commission on Non-Ionizing Radiation Protection (ICNIRP), "Guidelines on Limits of Exposure to Static Magnetic Fields," *Health Physics*, vol. 66, January, 1994, pp. 100-106.

**Table 5-1.**  
**Army Personnel Ionizing Radiation Exposure Standards.**

Category	Maximum <sup>1, 2, 3</sup>
Member of the general public	100 mrem (1 mSv) (TEDE) in calendar year <sup>4</sup>
Fetus/embryo of occupationally exposed declared pregnant woman	500 mrem (5 mSv) (DDE of mother + ED due to radionuclides in fetus/embryo) for entire pregnancy
Occupational exposure of adults	5 rem (0.05 Sv) (TEDE) in calendar year
Lens of the eye	15 rem (0.15 Sv) (EDE) in calendar year <sup>3</sup>
Individual organ	50 rem (0.5 Sv) (DDE + CDE) in calendar year
Skin or extremity	50 rem (0.5 Sv) (SDE) in calendar year
Occupational exposure of minors	10% of limits for adults

- 
1. From 10 CFR 20. Refer to 10 CFR 20 for detailed standards.
  2. Abbreviations: TEDE = total effective dose equivalent; DDE = deep dose equivalent; ED = effective dose; EDE = effective dose equivalent; CDE = committed dose equivalent; SDE = shallow dose equivalent.
  3. OSHA standard for occupational exposure of adults and for the lens of the eye is  $1\frac{1}{4}$  rem in calendar quarter. OSHA standard for skin of whole body is  $7\frac{1}{2}$  rem in calendar quarter. OSHA standard for hands and forearms; feet and ankles is  $18\frac{3}{4}$  rem in calendar quarter.
  4. The dose in any unrestricted area from external sources, exclusive of the dose contributions from patients administered radioactive material and released in accordance with applicable regulations, will not exceed 2 mrem (0.02 mSv) in any one hour.
-



**Table 5-2.**  
**Surface Radioactivity Values in dpm/100 cm<sup>2</sup>**

Nuclide <sup>a</sup>	Removable <sup>b, c</sup>	Total (Fixed + Remov- able <sup>b, d</sup> )
nat <sup>U</sup> , <sup>235</sup> U, <sup>238</sup> U, and associated decay products	1,000	5,000
Transuranics, <sup>226</sup> Ra, <sup>228</sup> Ra, <sup>230</sup> Th, <sup>228</sup> Th, <sup>231</sup> Pa, <sup>227</sup> Ac, <sup>125</sup> I, <sup>129</sup> I	20	500
nat <sup>Th</sup> , <sup>232</sup> Th, <sup>90</sup> Sr, <sup>223</sup> Ra, <sup>224</sup> Ra, <sup>232</sup> U, <sup>126</sup> I, <sup>131</sup> I, <sup>133</sup> I	200	1,000
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except <sup>90</sup> Sr and others noted above <sup>e</sup>	1,000	5,000
Tritium and tritiated compounds <sup>f</sup>	10,000	NA

- a. See para 5-3 for applicability of this table. This table is extracted from 10 CFR 835, appendix D. The values in this table apply to radioactive contamination deposited on, but not incorporated into the interior of, the contaminated item. Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, apply the limits established for alpha- and beta-gamma-emitting nuclides independently.
- b. As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.
- c. The amount of removable radioactive material per 100 cm<sup>2</sup> of surface area should be determined by swiping the area with dry filter or soft absorbent paper, applying moderate pressure, and then assessing the amount of radioactive material on the swipe with an appropriate instrument of known efficiency. (Note: The use of dry material may not be appropriate for tritium.) When removable contamination on objects of surface area less than 100 cm<sup>2</sup> is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped. Except for transuranics and <sup>228</sup>Ra, <sup>227</sup>Ac, <sup>228</sup>Th, <sup>230</sup>Th, <sup>231</sup>Pa and alpha emitters, it is not necessary to use swiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual surface contamination levels are within the limits for removable contamination.
- d. The levels may be averaged over one square meter provided the maximum surface activity in any area of 100 cm<sup>2</sup> is less than three times the value specified. For purposes of averaging, any square meter of surface shall be considered to be above the activity guide G if: (1) From measurements of a representative number  $n$  of sections it is determined that  $\frac{1}{n} \sum_{i=1}^n S_i \geq 3G$ , where  $S_i \geq G$  is the dpm/100 cm<sup>2</sup> determined from measurement of section  $i$ ; or (2) it is determined that the sum of the activity of all isolated spots or particles in any 100 cm<sup>2</sup> area exceeds 3G.
- e. This category of radionuclides includes mixed fission products, including the <sup>90</sup>Sr which is present in them. It does not apply to <sup>90</sup>Sr which has been separated from the other fission products or mixtures where the <sup>90</sup>Sr has been enriched.
- f. Tritium contamination may diffuse into the volume or matrix of materials. Evaluation of surface contamination shall consider the extent to which such contamination may migrate to the surface in order to ensure the surface radioactivity value provided in this table is not exceeded. Once this contamination migrates to the surface, it may be removable, not fixed; therefore a "Total" value does not apply.

**Table 5—3.**  
**Electromagnetic Radiation.**

<b>REGION</b>	<b>WAVELENGTH</b>	<b>FREQUENCY</b>	<b>AUTHORITY</b>
Ionizing (gamma and x rays)	< 100 nm	> 3 PHz ( $E > 12.4$ eV)	NRC and OSHA
Ultraviolet (UV)	100 to 380-400 nm	0.75-0.79 to 3 PHz	ACGIH
Visible (light)	380-400 to 760-780 nm	380-390 to 750-790 THz	ACGIH
Infrared (IR)	760-780 nm to 1 mm	300 GHz to 380-390 THz	ACGIH
Radiofrequency	1 mm to 100 km	3 kHz to 300 GHz	DOD
Extremely low frequency	> 100 km	< 3 kHz	ACGIH
Static electric fields	NA	NA	ACGIH
Static magnetic fields	NA	NA	ICNIRP

**Notes.**

1. Unit abbreviations: nm = nanometer ( $10^{-9}$  m); mm = millimeter ( $10^{-3}$  m); km = kilometer ( $10^3$  m); PHz = petahertz ( $10^{15}$  Hz); THz = terahertz ( $10^{12}$  Hz); GHz = gigahertz ( $10^9$  Hz); kHz = kilohertz ( $10^3$  Hz); and eV = electron volt ( $1 \text{ eV} = 1.6 \times 10^{-19}$  J).
2. Wavelength x frequency = speed of light =  $3 \times 10^8 \text{ m s}^{-1}$ .
3. Authority = The regulating authority for personnel exposure for the purposes of this regulation (para 5-4).

## **Chapter 6**

### **Special reporting requirements**

#### **6-1. General**

- a. Reporting requirements of AR 40-5, AR 385-40, and DA PAM 40-18 apply for radiation accidents, incidents, and over-exposures. Additional requirements are in paras b and 6-2.
- b. IMMEDIATELY EVACUATE PERSONNEL SUSPECTED OF EXPERIENCING POTENTIALLY DAMAGING EYE EXPOSURE FROM LASER RADIATION TO THE NEAREST MEDICAL FACILITY FOR AN EYE EXAMINATION (See FM 8-50). LASER EYE INJURIES REQUIRE IMMEDIATE SPECIALIZED OPHTHALMOLOGIC CARE TO MINIMIZE LONG-TERM VISUAL ACUITY LOSS. MEDICAL PERSONNEL SHOULD OBTAIN MEDICAL GUIDANCE FOR SUCH EMERGENCIES FROM THE WALTER REED ARMY INSTITUTE OF RESEARCH DETACHMENT AT BROOKS AFB (Commercial [800] 473-3549).
- c. Notify the installation or activity public affairs officer at the onset of the accident or incident in order to activate public affairs contingency measures (AR 360-5). Radiation accidents or incidents attract the attention of local and national media quickly. Early disclosure of accurate information is vital to maintaining the confidence of both the internal and external public.

#### **6-2. Ionizing radiation**

Federal reporting requirements for accidents, incidents, and over-exposures are in 10 CFR 20, subpart M and in 29 CFR 1910.1096(m) and 1926.53(o).

- a. Send information copies of all reports required by 10 CFR 20.2201 through 20.2205, 29 CFR 1910.1096(m), or 29 CFR 1926.53(o) and of any other accident or incident report to the NRC or OSHA through command channels to HQDA (DACS-SF), WASH DC 20310-0200.
- b. Reports through command channels will meet the same time requirements, as do required reports to the NRC and OSHA. For example, if the NRC requires immediate telephonic notification, follow it with immediate telephonic notification through the chain of command to HQDA (DACS-SF), WASH DC 20310-0200.

## **Appendix A Publications**

### **Section I Required Publications**

#### **ANSI N13.30**

American National Standards Institute, Performance Criteria for Radiobioassay. (Cited in para 1-4e(6).) (This publication may be obtained from American National Standards Institute, 1430 Broadway, New York, NY 10018.)

#### **ANSI Z136.1**

American National Standards Institute, American National Standard for Safe Use of Lasers. (Cited in paras 1-4k(e), 1-4n(5), 3-1a, and 5-4a.) (This publication may be obtained from the Laser Institute of America, Suite 125, 2424 Research Parkway, Orlando, FL 32826.)

#### **ANSI Z136.3**

American National Standards Institute, American National Standard for the Safe Use of Lasers in Health Care Facilities. (Cited in paras 3-1a, and 5-4a.) (This publication may be obtained from the Laser Institute of America, Suite 125, 2424 Research Parkway, Orlando, FL 32826.)

#### **AR 40-5**

Preventive Medicine. (Cited in paras 1-4g(3), (4), and (6); 1-4n(4); 2-7d; and 6-1a.)

#### **AR 40-10**

Health Hazard Assessment Program (HHA) in Support of the Army Materiel Acquisition Decision Process. (Cited in para 1-4g(5).)

#### **AR 40-13**

Medical Support-Nuclear/Chemical Accidents and Incidents. (Cited in para 1-4g(2).)

#### **AR 40-66**

Medical Record Administration. (Cited in para 5-2d(3).)

#### **AR 50-7**

Army Reactor Program. (Cited in paras 1-5b and 2-3a(6).)

#### **AR 70-1**

Systems Acquisition Policy and Procedure. (Cited in paras 1-8c and 2-1a.)

#### **AR 200-1**

Environmental Protection and Enhancement (Cited in para 2-1d.)

#### **AR 200-2**

Environmental Effects of Army Actions. (Cited in para 2-1d.)

#### **AR 360-5**

Public Information. (Cited in para 6-1c.)

#### **AR 385-10**

Army Safety Program. (Cited in para 1-4c(2).)

#### **AR 385-40**

Accident Reporting and Records. (Cited in para 6-1a.)

#### **AR 385-63**

Policies and Procedures for Firing Ammunition for Training, Target Practice and Combat. (Cited in para 3-1b.)

#### **AR 750-43**

Army Test, Measurement and Diagnostic Equipment Program. (Cited in paras 1-4d(4) and 2-8.)

**DA PAM 40-18**

Personnel Dosimetry Guidance and Dose Recording Procedures for Personnel Occupationally Exposed to Ionizing Radiation. (Cited in paras 1-4g(7), 1-4i(5)(b), 5-2b(4), and 6-1a.)

**DOD 4160.21-M-1**

Defense Demilitarization Manual. (Cited in para 3-2c.)

**DOD 4500.9-R (Part II)**

Defense Transportation Regulation - Cargo Movement. (Cited in para 2-6b.)

**DODI 6055.1**

DOD Occupational Safety and Health Program (Cited in para 1-4i(5)(a).)

**DODI 6055.11**

Protection of DOD Personnel from Exposure to Radiofrequency Radiation and Military Exempt Lasers. (Cited in paras 4-1a through c, 1-4g(7), 1-4j(4), and 5-4c.)

**FM 8-50**

Prevention and Medical Management of Laser Injuries. (Cited in para 6-1b.)

**FM 25-101**

Battle Focused Training. (Cited in para 1-8f.)

**FM 101-5**

Staff Organization and Operations. (Cited in paras 1-8f and 1-9c.)

**IEEE C95.3**

Institute of Electrical and Electronics Engineers, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields RF and Microwave. (Cited in para 4-2.) (This publication may be obtained from the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th St., New York, NY 10017.)

**MIL-HDBK-828**

Laser Range Safety. (Cited in paras 3-1b and 3-1c(1).) (This publication may be obtained from the Standardization Documents Order Desk, Building 4D, 700 Robbins Ave., Philadelphia, PA 19111-5094.)

**SB 11-206**

Personnel Dosimetry Supply and Service for Technical Ionizing Radiation Exposure Control. (Cited in para 1-4d(2)(a).)

**TB 750-43**

Army Test, Measurement, and Diagnostic Equipment (TMDE) Calibration and Repair Support Program. (Cited in paras 1-4d(4) and 2-8.)

**Title 10, CFR, Chapter I**

Nuclear Regulatory Commission. (Cited in paras 1-4d(2), 1-4d(2)(b) through (e); 2-1d; 2-3a(1) and (4); 2-3c(2); 2-4b(2); 2-5a; 5-2a(1), c(1)(a), and f; 6-2; and 6-2a.)

**Title 21, CFR, Subchapter J**

Radiological Health. (Cited in paras 3-2a.)

**Title 29, CFR, Part 1910**

Occupational Safety and Health Standards. (Cited in paras 1-4d(2)(d), 5-2a(2) and f, 6-2, and 6-2a.)

**Title 32, CFR, Part 655**

Radiation Sources on Army Land. (Cited in para 2-4.)

**Title 39, CFR**

U.S. Postal Service. (Cited in para 2-6b.)

**Title 40, CFR**

Environmental Protection Agency. (Cited in para 2-1d.)

**Title 49, CFR**

Department of Transportation. (Cited in paras 2-6b and 5-2f.)

**TM 3-261**

Handling and Disposal of Unwanted Radioactive Material. (Cited in para 1-4d(3).)

**Unnumbered Publication**

ACGIH Threshold Limit Values (TLVs™) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIs™). (Cited in para 5-4b.) (This publication may be obtained from the American Conference of Governmental Industrial Hygienists, Technical Affairs Office, 1330 Kemper Meadow Dr., Cincinnati, OH 45240.)

**Unnumbered publication**

International Commission on Non-Ionizing Radiation Protection (ICNIRP), Guidelines on Limits of Exposure to Static Magnetic Fields, *Health Physics*, vol. 66, pp. 100-106. (Cited in para 5-4d.)

**Section II****Related Publications**

A related publication is merely a source of additional information. The user does not have to read it to understand this regulation.

**AR 11-2**

Management Control

**AR 11-34**

The Army Respiratory Protection Program

**AR 25-400-2**

The Modern Army Recordkeeping System (MARKS)

**AR 50-5**

Nuclear Surety

**AR 55-38**

Reporting of Transportation Discrepancies in Shipments

**AR 70-6**

Type Classification of Army Materiel

**AR 190-54**

Nuclear Reactor Security Program

**AR 210-10**

Installations—Administration

**AR 385-16**

System Safety Engineering and Management

**AR 700-64/DLAM 4145.8/NAVSUPINST 4000.34/AFR 67-8/MCO P4400.105**

Radioactive Commodities in the DOD Supply Systems

**AR 700-93**

Processing and Shipping DOD Sponsored Retrograde Materiel Destined for Shipment to the United States, Its Territories, Trusts, and Possessions

**AR 725-50**

Requisitioning, Receipt, and Issue System

**AST-1500Z-100-93**

Identification Guide for Radioactive Sources in Foreign Materiel (This publication is available from Commander, U.S. Army Foreign Science and Technology Center, ATTN: IAFSTC-PO, 220 Seventh St. NE, Charlottesville, VA 22901-5396.)

**DODI 6055.8**

Occupational Radiation Protection Program

**IEEE C95.1**

Institute of Electrical and Electronics Engineers, IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz (This publication may be obtained from the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th St., New York, NY 10017.)

**NBS Handbook 107**

Radiological Safety in the Design and Operation of Particle Accelerators (The National Bureau of Standards is now known as the National Institute of Standards and Technology) (This publication may be obtained from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013-7082, or from the National Technical Information Service, 5258 Port Royal Rd., Springfield, VA 22161.)

**NBS Handbook 111**

Radiation Safety for x-ray Diffraction and Fluorescence Analysis Equipment (This publication may be obtained from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013-7082, or from the National Technical Information Service, 5258 Port Royal Rd., Springfield, VA 22161.)

**NBS Handbook 114**

General Safety Standards for Installations Using Non-Medical X-Ray and Sealed Gamma-Ray Sources, Energies up to 10 MeV (This publication may be obtained from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013-7082, or from the National Technical Information Service, 5258 Port Royal Rd., Springfield, VA 22161.)

**NCRP Reports**

Approximately 100 numbered reports on a variety of radiation safety topics (These publications may be obtained from the National Council on Radiation Protection and Measurements, 7910 Woodmont Ave., Suite 1016, Bethesda, MD 20814.)

**NRC Regulatory Guide 8.13**

Instruction Concerning Prenatal Radiation Exposure (This publication may be obtained from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013-7082, or from the National Technical Information Service, 5258 Port Royal Rd., Springfield, VA 22161.)

**NRC Regulatory Guide 8.29**

Instruction Concerning Risks from Occupational Radiation Exposure (This publication may be obtained from the U.S. Government Printing Office, P.O. Box 37082, Washington, DC 20013-7082, or from the National Technical Information Service, 5258 Port Royal Rd., Springfield, VA 22161.)

**TB 43-0116**

Identification of Radioactive Items in the Army

**TB 43-0121**

Inspection and Certification of RADIAC Meters (Dosimeters)

**TB 43-0122**

Instructions for the Safe Handling and Identification of U.S. Army Communications-Electronics Command-Managed Radioactive Items in the Army Inventory

**TB 43-0216**

Safety and Hazard Warnings for Operation and Maintenance of TACOM Equipment

**TB 43-0133**

Hazard Criteria for CECOM Radiofrequency and Optical Radiation Producing Equipment

**TB 43-0137**

Transportation Information for CECOM Radioactive Commodities (Use this bulletin for general guidance only; refer to 10 CFR 71 and 49 CFR for current NRC and DOT regulations.)

**TB 43-0141**

Safe Handling, Maintenance, Storage, and Disposal of Radioactive Commodities Managed by the U.S. Army Troop Support and Aviation Material Readiness Command

**TB 43-180**

Calibration and Repair Requirements for the Maintenance of Army Materiel

**TB 385-4**

Safety Requirements for Maintenance of Electrical and Electronic Equipment

**TB MED 502**

Respiratory Protection Program

**TB MED 506**

Occupational Vision

**TB MED 521**

Management and Control of Diagnostic X-Ray, Therapeutic X-Ray, and Gamma-Beam Equipment

**TB MED 522**

Control of Health Hazards from Protective Material Used in Self-Luminous Devices

**TB MED 523**

Control of Hazards to Health from Microwave and Radio Frequency Radiation and Ultrasound

**TB MED 524**

Control of Hazards to Health from Laser Radiation

**TB MED 525**

Control of Hazards to Health from Ionizing Radiation Used by the Army Medical Department

**Title 10, CFR, Part 835**

Occupational Radiation Protection

**TM 5-315**

Transportability Guidance for Safe Transport of Radioactive Materials (Use this manual for general guidance only; refer to 10 CFR 71 and 49 CFR for current NRC and DOT regulations.)

**TM 55-315**

Transportability Guidance for Safe Transport of Radioactive Materials (Use this manual for general guidance only; refer to 10 CFR 71 and 49 CFR for current NRC and DOT regulations.)

**TM 55-4470-400-12-1**

Transportability Guidance for Nuclear Reactor Irradiated Fuel Elements (Use this manual for general guidance only; refer to 10 CFR 71 and 49 CFR for current NRC and DOT regulations.)

**Section III****Prescribed Forms****DA Form 3337**

Application for Army Radiation Authorization. (Cited in para 2-3b(1).)

**Section IV****Referenced Forms****DA Form 11-2-R**

Management Control Evaluation Certification Statement

**DD Form 1952**

Dosimeter Application and Record of Occupational Radiation Exposure

**NRC Form 241**

Report of Proposed Activities in Non-Agreement States

## Appendix B

### Sample application for Army Radiation Authorization (DA Form 3337)

APPLICATION FOR ARMY RADIATION AUTHORIZATION	
For use of this form, see AR 11-9; the proponent agency is DAS	
1. THIS IS AN APPLICATION FOR (Check appropriate item) <input type="checkbox"/> NEW ARA <input type="checkbox"/> AMENDMENT TO ARA NUMBER _____ <input type="checkbox"/> RENEWAL OF ARA NUMBER _____	2. NAME, MAILING ADDRESS, AND E-MAIL ADDRESS OF APPLICANT (Include ZIP Code)
3. ADDRESSES WHERE AUTHORIZED IONIZING RADIATION SOURCES WILL BE USED OR POSSESSED	
4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION	5. TELEPHONE NUMBER AND FAX NUMBER
Items 6 through 12 may be continued on the following page or on 8 1/2 x 11 paper. The type and scope of information to be provided should be adequate to show complete compliance with applicable regulations and guidance. (If you can link use of radioactive material to a valid Nuclear Regulatory Commission (NRC) license, provide number and expiration date of the license and only submit changes that differ from the NRC license application and associated documents.)	
6. RADIATION SOURCE(S) a. RADIOACTIVE MATERIAL (Element and mass number, chemical and/or physical form, and maximum amount that you will possess at any one time.) b. ACCELERATOR(S) AND X-RAY SYSTEM(S) CAPABLE OF PRODUCING "HIGH RADIATION AREA" OR "VERY HIGH RADIATION AREA" (Describe)	
7. PURPOSE(S) FOR WHICH IONIZING RADIATION SOURCE(S) WILL BE USED	8. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING AND EXPERIENCE
9. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS	10. FACILITIES AND EQUIPMENT (Describe rooms or areas, shielding, safety devices, monitoring equipment, and so on.)
11. RADIATION SAFETY PROGRAM	12. WASTE MANAGEMENT
13. CERTIFICATION The applicant understands that all statements and representations made in this application are binding upon the applicant. The applicant and any official executing this certification on behalf of the applicant, named in Item 2, certify that all information contained in this application is true and correct to the best of their knowledge and belief.	
14. NAME, RANK, AND TITLE OF CERTIFYING OFFICER	15. SIGNATURE
	16. DATE (YYYYMMDD)

DA FORM 3337, MAY 1999

DA FORM 3337, MAR 80, IS OBSOLETE

USAPA V1.00



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ITEMS 6 THRU 12 (Continued)

**SAMPLE**

PAGE 2, DA FORM 3337, MAY 1999

USAPA V1.00

## **Appendix C**

### **Management Control Evaluation Checklist**

#### **C-1. Function**

The function covered by this checklist is radiation safety.

#### **C-2. Purpose**

The purpose of this checklist is to assist commanders and radiation safety officers in evaluating the key management controls listed below. It is not intended to cover all controls.

#### **C-3. Instructions**

Answers must be based on the actual testing of key management controls (for example, document analysis, direct observation, sampling, simulation, other). Answers that indicate deficiencies must be explained and corrective action indicated in supporting documentation. These management controls must be evaluated at least once every five years. Certification that this evaluation has been conducted must be accomplished on DA Form 11 2 R (Management Control Evaluation Certification Statement).

#### **C-4. Test questions**

- a. If required (para 1-4k(1)), has a person been designated to be radiation safety officer?
- b. If required (para 1-4k(2)), has a written radiation safety SOP been established?
- c. Are all personnel occupationally exposed to radiation receiving appropriate radiation safety training?
- d. Are all radiation sources secured against unauthorized use and removal?
- e. If the unit possesses radioactive commodities, has a written SOP been established to assure compliance with radiation safety requirements of applicable technical publications?
- f. Are all controllable quantities of radioactive material and radiation-producing sources held by the unit under appropriate authority (for example, a Nuclear Regulatory Commission license, an Army radiation authorization, or as part of a radioactive commodity)?
- g. Is all radioactive waste disposed of properly?
- h. Are all radiation survey instruments used for health and safety appropriately calibrated?
- i. For Army laser ranges have all type-classified or commercial class IIIb or class IV lasers received appropriate evaluation before their use?
- j. Are all unwanted military-exempt lasers disposed of properly?
- k. Are all accidents and incidents involving excessive personnel radiation exposure or excessive radioactive contamination of facilities, equipment, or the environment promptly reported through appropriate channels?
- l. Do all personnel occupationally exposed to ionizing radiation or radioactive material above applicable levels (paras 5-2b(1) and c(1)) participate in an appropriate dosimetry or bioassay program?
- m. Is the dose in all unrestricted areas less than 2 millirems (0.02 millisieverts) in any one hour?

#### **C-5. Supersession**

This is a new checklist.

#### **C-6. Comments**

Help make this a better tool for evaluating management controls. Submit comments to HQDA (DACS-SF), WASH DC 20310-0200.

## **Glossary**

### **Section I Abbreviations**

#### **ACGIH**

American Conference of Governmental Industrial Hygienists

#### **ACSIM**

Assistant Chief of Staff for Installation Management

#### **ADR**

automated dosimetry report

#### **AFB**

United States Air Force Base

#### **AIRDC**

Army Ionizing Radiation Dosimetry Center

#### **ALARA**

as low as is reasonably achievable

#### **ALI**

annual limit of intake

#### **ANSI**

American National Standards Institute

#### **AR**

Army Regulation

#### **ARA**

Army Radiation Authorization

#### **ARP**

Army Radiation Permit

#### **ARSC**

Army Radiation Safety Council

#### **ASA(I&E)**

Assistant Secretary of the Army (Installations and Environment)

#### **BEI™**

biological effectiveness index (ACGIH trademark)

#### **Bkd**

background

#### **CDRR**

Central Dosimetry Records Repository

#### **CECOM**

U.S. Army Communications-Electronics Command

#### **CEDE**

committed effective dose equivalent

#### **CFR**

Code of Federal Regulations

#### **CG**

Commanding General

**CHPPM**

U.S. Army Center for Health Promotion and Preventive Medicine

**cm**

centimeter

**DA**

Department of the Army

**DAC**

derived air concentration

**DASAF**

Director of Army Safety

**DOD**

Department of Defense

**DODI**

Department of Defense Instruction

**DOE**

Department of Energy

**dpm**

disintegrations per minute

**DOT**

Department of Transportation

**DSN**

Defense Switching Network

**EMR**

electromagnetic radiation

**EPA**

U.S. Environmental Protection Agency

**eV**

electron volt

**FY**

fiscal year

**GHz**

gigahertz

**GOCO**

Government-owned contractor-operated

**Gy**

gray

**h**

hour

**HHA**

health hazard assessment

**HQDA**

Headquarters, Department of the Army

**Hz**

hertz

**IAEA**

International Atomic Energy Agency

**ICNIRP**

International Commission on Nonionizing Radiation Protection

**IEEE**

Institute of Electrical and Electronics Engineers

**IR**

infrared

**kBq**

kilobecquerel

**kHz**

kilohertz

**km**

kilometer

**LSO**

laser safety officer

**m**

meter

**MACOM**

major Army command

**MARKS**

Modern Army Recordkeeping System

**METL**

mission-essential task list

 **$\mu$ Ci**

microcurie

**mg**

milligram

**MIL-HDBK**

military handbook

 **$\mu$ m**

micrometer

**mm**

millimeter

**MOS**

military occupational specialty

**mrad**

millirad

**mSv**

millisievert

**MTF**

medical treatment facility

**NARM**

naturally occurring or accelerated produced radioactive material

**NBS**

National Bureau of Standards (now named the National Institute of Standards and Technology)

**NCRP**

National Council on Radiation Protection and Measurements

**NGB**

National Guard Bureau

**NIST**

National Institute of Standards and Technology

**nm**

nanometer

**NORM**

naturally occurring radioactive material

**NRC**

U.S. Nuclear Regulatory Commission

**NSN**

National stock number

**NVLAP**

National Voluntary Laboratory Accreditation Program

**OSHA**

Occupational Safety and Health Administration

**PHz**

petahertz

**RAM**

radioactive material

**RDTE**

research, development, testing, and evaluation

**RF**

radiofrequency

**RSC**

radiation safety committee

**RSO**

radiation safety officer

**RSSO**

radiation safety staff officer

**SB**

supply bulletin

**SI**

Système Internationale (International System)

**SOFA**

status of forces agreement

**SOP**

standing operating procedure

**SSI**

specialty skill identifier

**Sv**

sievert

**TACOM**

U.S. Army Tank-Automotive and Armaments Command

**TB**

technical bulletin

**TB MED**

technical bulletin (medical)

**TEDE**

total effective dose equivalent

**THz**

terahertz

**TLV™**

threshold limit value (ACGIH trademark)

**TM**

technical manual

**TMDE**

test, measurement, and diagnostic equipment

**TOE**

table of organization and equipment

**TSG**

The Surgeon General

**U.S.C.**

United States Code

**CHPPM**

U.S. Army Center for Health Promotion and Preventive Medicine

**USAMC**

U.S. Army Materiel Command

**UV**

ultraviolet

**Section II****Terms****Absorbed dose**

The energy imparted by ionizing radiation per unit mass of irradiated material. The units of absorbed dose are the rad and the gray (Gy).

**Administrative dose**

The total effective dose equivalent that a radiation safety officer assigns when dosimetry is inaccurate or has been misused or lost.

**Agreement State**

Any State with which the Atomic Energy Commission or the NRC has entered into an effective agreement in which the State assumes many of the NRC's functions.

**ALARA**

Acronym for “as low as is reasonably achievable” means making every reasonable effort to maintain exposures to radiation as far below applicable dose limits as is practical consistent with the purpose for which the activity is undertaken, taking into account the state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations and in relation to utilization of nuclear energy, radioactive materials, and ionizing radiation in the public interest.

**Annual limit of intake (ALI)**

The derived limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year. ALI is the smaller value of intake of a given radionuclide in a year that would result in a committed effective dose equivalent of 5 rems (0.05 Sv) or a committed dose equivalent of 50 rems (0.5 Sv) to any organ or tissue.

**Army regulation**

A directive that sets forth missions, responsibilities, and policies, and establishes procedures to ensure uniform compliance with those policies.

**Army Reserve facilities**

Pertains to those facilities normally employed for the administration and training of Army Reserve units, in any entire structure or part thereof, including any interest in land, Army Reserve Center, and storage and other use areas.

**Background radiation**

Radiation from cosmic sources; naturally occurring radioactive material, including radon (except as a decay product of source or special nuclear material); and global fallout as it exists in the environment from the testing of nuclear explosive devices or from past nuclear accidents such as Chernobyl that contribute to background radiation. Background radiation does not include radiation from source, by-product, or special nuclear materials that the NRC regulates or from NARM that the Army regulates.

**Becquerel (Bq)**

The SI unit of radioactivity equivalent to one nuclear transformation per second.

**Bioassay (radiobioassay)**

The determination of kinds, quantities or concentrations, and, in some cases, the locations of radioactive material in the human body, whether by direct measurement (*in vivo* counting) or by analysis and evaluation of materials excreted or removed from the human body (*in vitro* counting).

**Byproduct material**

Any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material.

**Committed dose equivalent**

The dose equivalent to organs or tissue of reference that will be received from an intake of radioactive material by an individual during the 50-year period following the intake.

**Committed effective dose equivalent**

The sum of the products of the weighting factors applicable to each of the body organs or tissues that are irradiated and the committed dose equivalent to these organs or tissues.

**Commodity, radioactive**

See Radioactive commodity

**Condition**

The status of personnel and equipment (readiness) as they interact with the operational environment during mission planning and execution.

**Control**

Action taken to eliminate hazards or reduce their risk.

**Curie (Ci)**

A unit of radioactivity equal to 37 billion becquerels.



**Declared pregnant woman**

A woman who has voluntarily informed her employer, in writing, of her pregnancy and the estimated date of conception.

**Decommission**

To remove (as a facility) safely from service and reduce residual radioactivity to a level that permits release of the property for unrestricted use and termination of the NRC license, Army reactor permit, or Army radiation authorization.

**Deep-dose equivalent**

Applies to external whole-body exposure and is the dose equivalent at a tissue depth of 1 centimeter ( $1000 \text{ mg/cm}^2$ ).

**Derived air concentration (DAC)**

The concentration of a given radionuclide in air that, if breathed for a working year of 2,000 hours under conditions of light work (inhalation rate 1.2 cubic meters of air per hour), results in an inhalation of one ALI.

**Develop the Force**

One of the Army's four core capabilities. This capability includes the processes of developing doctrine; developing requirements; acquiring, training and sustaining people; and identifying and developing leaders. This core capability encompasses the various functions that must be accomplished to create tactical units that comprise the Operational Force.

**Deviation**

A departure from the requirements of this regulation.

**Direct and Resource the Force**

One of the Army's four core capabilities comprised of four core processes: planning and policy development; direction and assessment; financial management; and information management. These processes have six functions: Leadership; Human Resource Management; Force Management; Military Strategy; Acquisition and Logistics Management; and Installations & Facilities Management.

**Dose equivalent**

The product of absorbed dose in tissue, quality factor and all other necessary modifying factors at the location of interest in tissue. The units of dose equivalent are the rem and sievert (Sv).

**Effective dose equivalent**

The sum of the products of the dose equivalent to the organ or tissue and the weighting factors applicable to each of the body organs or tissues that are irradiated. The units of dose equivalent are the rem and sievert (Sv).

**Electromagnetic radiation**

Electric and magnetic fields that oscillate at right angles to each other and to their direction of propagation and that travel at the speed of light in a vacuum (300,000 kilometers per second). Electromagnetic radiation includes gamma rays, x rays, ultraviolet radiation, visible light, infrared radiation, radiofrequency radiation, and extremely low frequency electromagnetic radiation (see table 5-3).

**Electron volt (eV)**

A unit of energy equal to  $1.6 \times 10^{-19}$  joule.

**Exposure**

In risk management, the frequency and length of time subjected to a hazard.

**Extremely low frequency (ELF) electromagnetic radiation**

Electromagnetic radiation with a frequency less than 3 kHz.

**Eye dose equivalent**

Applies to the external exposure of the lens of the eye and is taken as the dose equivalent at a tissue depth of 0.3 centimeter ( $300 \text{ mg cm}^2$ ).

**Giga- (G)**

An SI unit prefix indicating a factor of one billion ( $10^9$ ).

**Gray (Gy)**

The SI unit of absorbed dose. One gray is equal to an absorbed dose of 1 joule/kilogram (100 rads).

**Hazard**

Any real or potential condition that can cause injury, illness, death of personnel, damage to or loss of equipment or property, or mission degradation.

**Hertz (Hz)**

The SI unit of frequency equivalent to one vibration (cycle) per second.

**High radiation area**

An area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.1 rem (1 mSv) in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates.

**Infrared (IR) electromagnetic radiation**

Electromagnetic radiation with a wavelength between 760-780 nm and 1 mm.

**Installation**

A grouping of facilities located in the same vicinity, which support particular functions. Installations may be elements of a base. Land and improvements permanently affixed thereto which are under the control of the Department of the Army and used by Army organizations. Where installations are located contiguously, the combined property is designated as one installation and the separate functions are designated as activities of that installation. In addition to those used primarily by troops, the term installation applies to real properties such as depots, arsenals, ammunition plants (both contractor and Government operated), hospitals, terminals, and other special mission installations. For the purposes of this regulation, United States Army Regional Support Commands are installations.

**Ionizing radiation**

Charged subatomic particles and ionized atoms with kinetic energies greater than 12.4 eV, electromagnetic radiation with photon energies greater than 12.4 eV, and all free neutrons and other uncharged subatomic particles (except neutrinos and antineutrinos).

**Kilo- (k)**

An SI unit prefix indicating a factor of 1000.

**Laser**

A device that produces an intense, coherent, directional beam of light by stimulating electronic or molecular transitions to lower energy levels. An acronym for light amplification by stimulated emission of radiation. Lasers are classified by degree of potential hazard (see 21 CFR 1040.10 and ANSI Z136.1 for comprehensive definitions of laser hazard classes).

- a. Class I lasers emit at levels that are not hazardous under any viewing or maintenance conditions. They are exempt from control measures. (However, as a matter of good safety practice avoid intrabeam viewing in case the laser is mislabeled.)
- b. Class II lasers (low-power) emit in the visible light portion of the electromagnetic spectrum. They are a potential eye hazard only for prolonged intrabeam viewing. Eye protection is normally afforded by the aversion response including the blink reflex.
- c. Class III (medium-power) lasers emit in the infrared, visible, or ultraviolet portions of the electromagnetic spectrum. They are a hazard for direct intrabeam and specular reflection viewing. Diffuse reflection is not normally a hazard.
  - (1) Class IIIa lasers, even though they emit at class III power levels, have special beam characteristics that make them eye-safe except when viewed through magnifying optics.
  - (2) Class IIIb lasers are all other class III lasers.
- d. Class IV (high-power) lasers emit in the infrared, visible, or ultraviolet portions of the electromagnetic spectrum. They are hazardous for direct intrabeam exposure and sometimes diffuse reflection exposure to the eyes or skin. They may also produce fire, material damage, laser-generated air contaminants, and hazardous plasma radiation.

**Low-level radioactive waste**

See Radioactive waste, low-level.

**Materiel readiness command**

A major subordinate command of the U.S. Army Materiel Command responsible for National Inventory Control Point (NICP) and National Maintenance Point (NMP) functions for assigned items (AR 725-50).

**Member of the public**

Any individual except when that individual is receiving an occupational dose.

**Micro-(μ)**

An SI unit prefix indicating a factor of one one-millionth ( $10^{-6}$ ).

**Military-exempt lasers**

Those lasers and laser systems that the U.S. Food and Drug Administration has exempted from the provisions of 21 CFR 1040.10 and 1040.11 and of 21 CFR 1002 (except 21 CFR 1002.20) (exemption no. 76-EL-01 DOD). These laser products are used exclusively by DOD components and are designed for actual combat or combat training operations or are classified in the interest of national security.

**Milli- (m)**

An SI unit prefix indicating a factor of one one-thousandth (0.001).

**Naturally occurring or accelerator produced radioactive material (NARM)**

Radioactive material not classified as byproduct, special, or source material; NARM includes NORM (naturally occurring RAM).

**Nonionizing radiation**

Electromagnetic radiation with photon energies less than 12.4 eV

**Occupational dose**

The dose received by an individual in the course of employment in which the individual assigned duties involve exposure to radiation or to radioactive material from regulated and unregulated sources of radiation, whether in the possession of the employer or other person. Occupational dose does not include dose received from background radiation; from any medical administration the individual has received; from exposure to patients administered radioactive material and released in accordance with applicable regulations; from voluntary participation in medical research programs; or as a member of the public.

**Optical radiation**

See Visible light.

**Peta- (P)**

An SI unit prefix indicating a factor of one million billion ( $10^{15}$ ).

**Probability**

The likelihood that an event will occur.

**Project the force**

One of the Army's four core capabilities. This capability includes the processes of tailoring, mobilizing and projection of land power, and supporting organizational training. Recognized as the overriding capability by which the Army will be measured is the ability to rapidly deploy ready forces into a distant area of operations and keep them coming as dictated by the tempo of battle.

**Qualified expert**

A person who, by virtue of training and experience, can provide competent authoritative guidance about certain aspects of radiation safety. Being a qualified expert in one aspect of radiation safety does not necessarily mean that a person is a qualified expert in a different aspect. Forward requests for determination of whether a certain individual is a qualified expert through command channels to the MACOM RSSO as necessary. Forward these requests to HQDA (DACS-SF), WASH DC 20310-0200, for further evaluation as necessary.

**Quality factor**

The modifying factor [listed in 10 CFR 20.1004, tables 1004(b).1 and 1004(b).2] that is used to derive dose equivalent from absorbed dose.

**Rad**

A unit of absorbed dose. One rad is equal to an absorbed dose of 0.01 joule/kilogram (0.01 gray).

**Radiation**

For the purposes of this regulation, unless otherwise specified, radiation includes both ionizing and nonionizing radiation.

**Radiation area**

An area, accessible to individuals, in which radiation levels could result in an individual receiving a dose equivalent in excess of 0.005 rem (0.05 mSv) in 1 hour at 30 centimeters from the radiation source or from any surface that the radiation penetrates.

**Radiation safety**

For the purposes of this regulation, a scientific discipline whose objective is the protection of people and the environment from unnecessary exposure to radiation. Radiation safety is concerned with understanding, evaluating, and controlling the risks from radiation exposure relative to the benefits derived. Same as *health physics and radiation protection*.

**Radiation safety committee**

An advisory committee for the commander to assess the adequacy of the command's radiation safety program. Same as *radiation control committee and radiation protection committee*.

**Radiation Safety Officer**

The person that the commander designates, in writing, as the executive agent for the command's radiation safety program. Same as *radiation protection officer or health physics officer*.

**Radiation safety program**

A program to implement the objective of radiation safety.

- a. The Army's radiation safety program includes all aspects of:
  - (1) Measurement and evaluation of radiation and radioactive material pertaining to protection of personnel and the environment.
  - (2) Army compliance with Federal and DOD radiation safety regulations.
  - (3) The Army's radiation dosimetry, radiation bioassay, radioactive waste disposal, radiation safety training, and radiation instrument TMDE and calibration programs.
- b. A command's radiation safety program includes all aspects of:
  - (1) Measurement and evaluation of radiation and radioactive material within the command as they pertain to protection of personnel and the environment.
  - (2) Compliance with Federal, DOD, and Army radiation safety regulations.

**Radioactive commodity**

An item of Government property made up in whole or in part of radioactive material. A national stock number (NSN) or part number is assigned to commodities containing radioactive material greater than 0.01 Ci.

**Radioactive waste**

Solid, liquid, or gaseous material that contains radionuclides regulated under the Atomic Energy Act, as amended, or is of sufficient quantity to require an Army radiation authorization, and is of negligible economic value considering the cost of recovery.

**Radioactive waste, low-level**

Material the NRC classifies as low-level radioactive waste (see 10 CFR 62.2); waste not classified as high-level radioactive waste (spent nuclear fuel), as transuranic waste, or as uranium or thorium tailings and waste; material acceptable for burial in a land disposal facility (10 CFR 61).

**Radiobioassay**

See bioassay.

**Radiofrequency (RF) electromagnetic radiation**

Electromagnetic radiation with frequencies between 3 kHz and 300 GHz.

**Radiofrequency (RF) controlled environment**

Locations where RF exposure may be incurred by persons who are aware of the potential for occupational exposure, by other cognizant persons, or as the incidental result of transient passage through areas where analysis shows the exposure levels may be above those shown in DODI 6055.1, table 6-2-1, but do not exceed those shown in DODI 6055.1, table 6-1-1. Existing physical arrangements or areas, such as fences, perimeters, or weather deck(s) of a ship may be used in establishing a controlled environment.

**Radiofrequency (RF) uncontrolled environments**

Locations where RF exposures do not exceed permissible exposure levels in DODI 6055.1, table 6-2-1. Such locations generally represent living quarters, workplaces, or public access areas where personnel would not expect to encounter higher levels of RF energy.

**Recorder, RSC**

The person directly responsible for the accuracy and completeness of the RSC minutes. The recorder may designate someone else to take notes at RSC meetings (for example, an assistant or secretary). The recorder should be the RSO to help assure that the minutes meet regulatory requirements.

**Rem**

A unit of any of the quantities expressed as dose equivalent. The dose equivalent in rems is equal to the absorbed dose in rads multiplied by the quality factor (1 rem = 0.01 sievert).

**Residual Risk**

The level of risk remaining after controls have been identified and selected for hazards that may result in loss of combat power. Controls are identified and selected until residual risk is at an acceptable level or until it cannot be practically reduced any further.

**Risk**

Chance of hazard or bad consequences; exposure or chance of injury or loss. Risk level is expressed in terms of hazard probability and severity.

**Risk assessment**

The identification and assessment of hazards (first two steps of the risk management process).

**Risk decision**

The decision to accept or not accept the risk(s) associated with an action; made by the commander, leader, or individual responsible for performing that action.

**Risk management**

A logical five step thought process, applicable to any situation or environment, for identifying and controlling hazards to protect the force.

**Risk management integration**

The process by which individuals or organizations develop plans to embed risk management into all that they do.

**Severity**

The expected consequence of an event in terms of degree of injury, property damage, or other mission impairing factors (loss of combat power, adverse publicity, and so on), that should occur.

**Shallow dose equivalent**

Applies to the external exposure of the skin or an extremity and is taken as the dose equivalent at a tissue depth of 0.007 centimeter ( $7 \text{ mg cm}^{-2}$ ) averaged over an area of 1 square centimeter.

**Sievert (Sv)**

The SI unit of any of the quantities expressed as dose equivalent. The dose equivalent in sieverts is equal to the absorbed dose in grays multiplied by the quality factor ( $1 \text{ Sv} = 100 \text{ rem}$ ).

**Source material**

Uranium or thorium, or any combination thereof, in any physical or chemical form or ores that contain by weight one-twentieth of one percent (0.05%) or more of uranium, thorium, or any combination thereof. Source material does not include special nuclear material.

**Special nuclear material**

Plutonium, uranium-233, uranium enriched in the isotope 233 or in the isotope 235, or any material artificially enriched by any of the foregoing.

**Sustain the Force**

One of the Army's four core capabilities. This capability includes the processes of acquiring, maintaining and sustaining equipment; maintaining and sustaining land operations; acquiring and sustaining infrastructure and operating installations.

**Tera- (T)**

An SI unit prefix indicating a factor of one trillion ( $10^{12}$ ).

**Total effective dose equivalent**

The sum of the deep-dose equivalent (for external exposures) and the committed effective dose equivalent (for internal exposures).

**Type classification**

A designation the Army uses to indicate acceptability for service use (AR 70-61).

**Ultraviolet (UV) electromagnetic radiation**

Electromagnetic radiation with wavelengths between 100 nm and 380-400 nm.

**United States Army Reserve Center**

A home station facility, activity, or installation utilized for administration and training of United States Army Reserve units and personnel.

**Unrestricted area**

An area, access to which is neither limited nor controlled (for the purposes of ionizing radiation safety).

**Very high radiation area**

An area, accessible to individuals, in which radiation levels could result in an individual receiving an absorbed dose in excess of 500 rads (5 grays) in 1 hour at 1 meter from a radiation source or from any surface that the radiation penetrates.

**Visible light**

Electromagnetic radiation with wavelengths between 380-400 nm and 760-780 nm.

**Weighting factor**

For an organ or tissue, the proportion of the risk of stochastic effects resulting from irradiation of that organ or tissue to the total risk of stochastic effects when the whole body is irradiated uniformly.

## **Index**

**Accidents, 1-4d(5), 1-4g(2), 1-4g(7), 1-4k(2)(a), 1-4l(10), 1-9e, 5-2e(3)(a), 6-1a through c, 6-2**

**Administrative dose, 1-4d(2)(b), 5-2d(2), 5-2e**

**Army radiation authorization (ARA), 1-4d(1), 1-4g(3), 1-4i(1), 1-4i(3), 1-4k(1)(a), 1-4k(4), 1-9a, 2-1b, 2-2, 2-5b, 2-6a(2), 2-7d**

**Army radiation permit (ARP), 1-4j(5), 1-4k(4), 1-4o(1), 1-7, 2-4**

**Army Radiation Safety Council (ARSC), 1-4c(3)**

**Army reactor permit, 1-4g(3), 1-4o(1), 1-7, 1-9a, 2-1b, 2-2a(6), 2-7d**

**Audit, annual, 1-4k(1)(b)**

**Automated dosimetry record (ADR), see Personnel dosimetry reports**

**Bioassays, 1-4d(2)(b), 1-4g(6), 1-4k(1)(c), 5-2c**

**Calibration, 1-4d(4), 2-8**

**Central Dosimetry Records Repository (CDRR), 1-4d(2)(b), 5-2e(3)(b)**

**Contamination, see Radioactive contamination**

**Controls, see Shielding**

**Decommissioning, 1-4h, 1-4l(3), 2-5**

**Deployment, 1-4e(3), 1-4f(2), 1-4g**

**Dose limits, see Exposure standards**

**Dosimetry, 1-4d(2), 1-4k(1)(b), 5-2b**

**Environmental requirements, 2-1d**

**Exposure standards, 1-4e(1) and (2), 1-4l(3), 1-8b, 5-2a, 5-4**

**Foreign equipment and materiel, 1-4f(2), 1-4g(1), 1-4i(4)**

**Foreign military sales, 1-4d(6)**

**Health hazard assessment (HHA), 1-4g(5)**

**Incidents, see Accidents**

**Inventory, 1-4k(4), 1-4p(2)(c)**

**Laser class IIIb or class IV, 1-4k(1)(d), 3-1c, 3-1e military-exempt, 1-4i(6), 1-4l(10), 3-1a, 3-2 range, 3-1b**

**Machine-produced ionizing radiation source, 2-3a, 2-3a(5), 2-4b(3)**

**Mission-essential task list (METL), 1-4f(1)**

**Moonlighting, see Off-duty employment**

**Nuclear Regulatory Commission (NRC) Communication with, 2-2b License, 1-4d(1), 1-4g(3), 1-4i(1), 1-4k(1)(a), 1-4k(4), 1-4o(1), 1-7, 1-9a, 2-1b, 2-2, 2-4b(1), 2-5a, 2-6a(2), 2-7d**

**Occupational health surveillance, 1-4g(4), 1-4n(3) and (4), 5-2d(3)**

**Off-duty employment, 1-4d(2)(b)**

**Overseas controls, 1-8e, 2-4b(4), 2-6b**

**Personnel dosimetry reports, 1-4d(2)(c), 1-4e(4), 5-2d(3)**

**Protective clothing, radiofrequency, 4-1c**

**Public affairs, 6-1c**

**Qualified expert, 2-1c, 3-1d**

**Radioactive commodities, 1-4d(1), 1-4f(1), 1-4g(5), 1-4i(1), 1-4k(5), 1-8d, 2-1b, 2-6a(1)**

**Radioactive contamination, 1-4d(5), 1-4g(2), 1-4h, 1-4i(4), 5-3**

**Radioactive release, 2-4d, 2-7c**

**Radioactive waste, low-level, 1-4d(3), 1-4l(4), 2-4d, 2-6c, 2-7**

**Radiofrequency controlled environment, 1-4j(4)**

**Radiological health, 1-4e(3)**

**Radium, 2-2a(2), 2-6c**

**Reports, 6-2**

**Research, development, testing, and evaluation (RDTE), 1-8c, 2-1a**

**Responsibilities Army Radiation Safety Council, 1-5**

Army Radiation Safety Officer (Army RSO), 1-4l, 1-5b, 1-9f

Assistant Chief of Staff for Installation Management (ACSIM), 1-4h, 1-5b

Assistant Secretary of the Army (Installations, Logistics, and Environment) [ASA(IL&E)], 1-4a

Assistant Secretary of the Army (Manpower and Reserve Affairs), 1-4b, 1-5b

Chief, Army Ionizing Radiation Dosimetry Center (AIRDC), 1-4d(2), 5-2d(2), 5-2e(3)(b)

Chief, Army Reserve, 1-5b

Chief, National Guard Bureau, 1-5b, 1-9b(3)

Commander, 1-4k, 2-2a(4), 2-2b(3)

Commanding General,

Center for Health Promotion and Preventive Medicine (CG, CHPPM), 1-4g(6), 2-2a(3), 2-3d, 3-1c, 3-2d, 4-2a

Commanding General, U.S. Army Materiel Command (CG, AMC), 1-4d

Commanding General, U.S. Army Medical Command (CG, MEDCOM), 1-4g

Commanding General, U.S. Army Training and Doctrine Command (CG, TRADOC), 1-4f

Director of Army Safety (DASAF), 1-4c, 1-5b, 1-9f

Installation commander, 1-4j

Installation Radiation Safety Committee, 1-6

Installation Radiation Safety Officer, 1-4n, 1-6b, 1-7b and c

Laser Safety Officer (LSO), 1-4o

Major Army command commanding general, 1-4i, 1-9b(1) 1-4d(2)

Radiation Safety Officer (RSO), 1-4d(2)(c) and (d), 1-4o, 1-6b, 1-7b and c, 1-8a, 5-2d(2) and (3), 5-2e(2) and (3)

Radiation Safety Staff Officer (RSSO), 1-4m, 1-5b, 2-1c, 2-2d, 2-3b, 2-3d

Radiological Hygiene Consultant to The Surgeon General, 1-5b

Superintendent, U.S. Military Academy, 1-9b(2) Surgeon General, 1-4e, 1-9b, 1-9f, 5-2e(1)

**Risk management, 1-4c(2), 1-4i(5), 1-4l(11), 1-8c(2), 1-8f, 1-9, 5-3c**

**Shielding and controls, 2-1c**

**Surveillance, see Occupational health surveillance**

**Survey instruments, 2-8**

**Test, measurement, and diagnostic equipment (TMDE) program, 1-4d(4)**

**Third-party liability, 1-4i(1), 1-4k(5), 2-1b, 2-2a(2)**

**Training, 1-4f(1) and (2), 1-4g, 1-4k(3)**

**Transfer and transport, 2-6, 2-7b**

**X-ray system, see Machine-produced ionizing radiation source**